

NON-PUBLIC?: N

ACCESSION #: 8809260220
LICENSEE EVENT REPORT (LER)

FACILITY NAME: McGuire Nuclear Station, Unit 2 PAGE: 1 OF 6

DOCKET NUMBER: 05000370

TITLE: Manual Reactor Trip when Main Feedwater Control Valve Failed Closed
when Solenoid Valve for the Air Supply was Accidently Damaged
EVENT DATE: 07/31/88 LER #: 88-008-00 REPORT DATE: 08/30/88

OPERATING MODE: 1 POWER LEVEL: 100

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR
SECTION
50.73(a)(2)(iv)

LICENSEE CONTACT FOR THIS LER:
NAME: Steven E Leroy, Licensing TELEPHONE: 704-373-6233

COMPONENT FAILURE DESCRIPTION:
CAUSE: SYSTEM: COMPONENT: MANUFACTURER:
REPORTABLE TO NPRDS:

SUPPLEMENTAL REPORT EXPECTED: no

ABSTRACT: On 7/31/88 at 1917, valve 2CF-32AB, 2A Steam Generator main Feedwater Regulating Valve, failed in the closed position. Preventive Maintenance Inc. (PMI) personnel were removing a fan from above valve 2CF-32AB actuator when the fan was set on the electrical cable attached to valve 2CFSVO320, Feedwater Flow (CF) to Steam Generator (S/G) 2A Solenoid, and broke a wire in the cable. Valve 2CFSVO320 deenergize which failed the air supply to the actuator for valve 2CF-32AB, causing the valve to fail closed. With CF flow isolated to S/G 2A, the water level began to rapidly decrease. At 1918, Operations manually tripped the Unit 2 Reactor to prevent a automatic trip. Auxiliary Feedwater (CA) Motor Driven Pumps 2A and 2B auto-started at 1918 in response to the S/G 2A Low Low level signal. Operations stabilized Unit 2 at approximately 1948. Instrumentation and electrically repaired the broken wire on valve 2CFSVO320 and returned valve 2CF-32AB to service at approximately 2330. Operations returned Unit 2 to power operation at approximately 1015 on 08/1/88. This event is assigned a cause of Personnel Error because while removing a fan from above the valve 2CF-32AB actuator, PMI Mechanic A lost his footing and accidentally set the fan on the electrical cable to valve 2CFSVO320

causing a loss of power to valve 2CFSVO320 and a resultant loss of air supply to valve 2CF-32AB.

END OF ABSTRACT

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INTRODUCTION:

On July 31, 1988 at 1917, valve 2CF-32AB, 2A Steam Generator Main Feedwater Regulating Valve EIIS:FCV!, failed in the closed position. Preventive Maintenance Inc. (PMI) personnel were removing a fan from above valve 2CF-32AB actuator EIIS:84! when the fan was set on the electrical cable attached to valve 2CFSVO320, Feedwater Flow to Steam Generator 2A Solenoid EIIS:SOL!, and broke a wire in the cable. Valve 2CFSVO320 deenergized which failed the air supply to the actuator for valve 2CF-32AB, causing the valve to fail to the closed position. With Main Feedwater EIIS:SJ! flow isolated to Steam Generator EIIS:SG! 2A, the water level began to rapidly decrease. At 1918, Operations personnel manually tripped the Unit 2 Reactor EIIS:RCT! to prevent an impending automatic trip from a Steam Generator 2A Low Level condition. Auxiliary Feedwater Motor EIIS:MO#! Driven Pumps EIIS:P! 2A and 2B automatically started at 1918 in response to the Steam Generator 2A Low Low Level signal. Operations personnel stabilized Unit 2 at approximately 1948. Operations personnel notified the NRC at approximately 2030 of the Reactor Trip and Auxiliary Feedwater EIIS:BA) start. Instrumentation and Electrical personnel repaired the broken wire on valve 2CFSVO320 and returned valve 2CF-32AB to service at approximately 2330. Operations personnel returned Unit 2 to power operation at approximately 1015 on August 1, 1988.

Unit 2 was in Mode 1, Power Operation, at 100% power at the time of this event.

This event is assigned a cause Personnel Error because while removing a fan from above the valve 2CF-32AB actuator, PMI Mechanic A lost his footing and accidentally set the fan on the electrical cable to valve 2CFSVO320. The weight of the fan broke a wire at the connection point. This caused a loss of power to valve 2CFSVO320 and a resultant loss of air supply to valve 2CF-32AB.

EVALUATION:

Background

The Main Feedwater system provides feedwater- flow to the four Steam Generators for all unit operating conditions. Individual Unit 2 Steam Generator feedwater flow is controlled by air operated control valves 2CF-17, 20, 23, and 2CF-32 EIIS:V! for Steam Generators 2D, 2C, 2B, and 2A, respectively.

Each control valve has two solenoid valves in series in the control air supply line. The two solenoid valves are powered from either Train A or Train B Direct Current (DC) power. During normal operating conditions, both solenoid valves will be energized which will allow control air to flow to the pneumatic valve controller. On loss of power to either solenoid valve, the solenoid valve will isolate and vent the controller air supply, and the control valve will fail closed. The Solid State Protection System EHS:JC! will automatically deenergize the solenoid valves on a Safety Injection signal, High High Steam Generator Level signal, Reactor Trip coincident with Low T signal, High High Doghouse water level signal, or a manual initiation of a Feedwater Isolation signal from the Control Room.

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PMI is a company contracted by McGuire Mechanical Maintenance to perform on-line leak sealant work on valves, flanges, and piping. The work is done by injecting a leak sealant material into the area of the leak on the valve, flange, or piping. Some leak repairs require a clamp or other restrictive device be placed around the leak to prevent the sealant from leaking or blowing out. The work is normally performed with the plant and/or system at full operating temperature and pressure.

Description of Event

Valve 2CF-20AB, 2C Steam Generator Main Feedwater Regulating Valve, developed a body to bonnet leak when Unit 2 was increasing power on July 29, 1988 after a refueling outage. PMI personnel began work on July 31, 1988 at approximately 0800 to inject leak sealant to stop this leak. A large portable fan (approximately 70 pounds) was placed on top of the valve 2CF-32AB actuator and tied to a nearby pipe hanger to blow steam away from valve 2CF-20AB so PMI personnel could see and work around the leak. PMI personnel placed a clamp around the body to bonnet flange of valve 2CF-20AB and then injected leak sealant which successfully stopped the leak. At approximately 1900, PMI personnel began clearing the work area of equipment and material. PMI Mechanic A was standing on a scaffold next to valve 2CF-32AB at approximately the same height as the valve body. He untied the fan and picked it up from the top of the valve 2CF-32AB actuator and while lowering it to the scaffold lost his footing and set the fan onto an electrical cable at the connection point to solenoid valve 2CFSVO320. The weight of the fan broke one of the wires in the cable where it connects to the solenoid valve, and the solenoid valve deenergized, which failed the air supply to the actuator for valve 2CF-32AB.

At 1917:56, valve 2CF-32AB failed closed. Operations Control Room personnel noticed that Steam Generator 2A level was decreasing rapidly, and valve 2CF-32AB demand indication was at 100%. Steam Generator 2A level was rapidly approaching

the Low Low Level Reactor Trip setpoint. At 1918:49, Operations Control Room personnel manually opened the Reactor Trip breakers to trip the Reactor. The Turbine Generator automatically tripped immediately after the Reactor Trip. Also at 1918:49, the Auxiliary Feedwater system Motor Driven Pumps started automatically as a result of the Steam Generator 2A Low Low level signal.

Operations personnel implemented procedure AP/2/A/5500/01, Unit 2 Reactor Trip recovery, and stabilized Unit 2 by approximately 1948 on July 31, 1988. The Auxiliary Feedwater system Motor Driven Pumps were secured by Operations personnel at approximately 2100. Operations personnel implemented procedure RP/O/A/5700/10, NRC Immediate Notification Requirements, at approximately 2030 to notify the NRC of the Reactor Trip and automatic start of the Auxiliary Feedwater system Motor Driven Pumps, which is an Engineered Safety Features EIIS:JE! Actuation.

Instrumentation and Electrical personnel repaired the broken wire on valve 2CFSVO320 at approximately 2330 on July 31, 1988. Valve 2CF-32AB was then returned to service. Unit 2 returned to Mode 1 on August 1, 1988 at 1015.

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Conclusion

This event is assigned a cause of Personnel Error because while removing a fan from above the valve 2CF-32AB actuator, PMI Mechanic A lost his footing and accidentally set the fan on the electrical cable to valve 2CFSVO320 and broke a wire at the connection point. This caused a loss of power to valve 2CFSVO320 which isolated the air supply to the actuator for valve 2CF-32AB and caused the valve to fail closed.

The working conditions around these valves were clean and well lit, scaffolding was adequate, and room was available to work comfortably. The only factor which may have contributed to this accident was that PMI Mechanic A had worked approximately 12 hours in a high temperature area, and this may have reduced his attention to detail.

There were no anomalies noted during this Reactor Trip. All primary and secondary system parameters responded as expected during this transient. Operations personnel responded in a timely and efficient manner to stabilize the unit. Approximately 30 minutes after the Reactor Trip, Pressurizer EIIS:PZR! level and pressure, Steam Generator level and pressure, and Reactor Coolant system EIIS:AB! temperature had all achieved stable no-load conditions. The Auxiliary Feedwater system Motor Driven Pumps started automatically and responded properly to provide feedwater to the Steam Generators. Operations personnel secured the Auxiliary Feedwater system Motor Driven Pumps at approximately 2100.

After valve 2CF-32AB was returned to service, a valve stroke timing test was performed by Performance personnel. The procedure used to document the valve stroke timing test requires that the unit be in Mode 5 (Cold Shutdown) or Mode 6 (Refueling). In the past, a temporary procedure change had been implemented to allow for this procedure to be used in Mode 3 (Hot Standby). Performance personnel did not obtain the necessary procedure change for the test of valve 2CF-32AB. This was a violation of the procedure. The valve stroke timing test was performed successfully, and the results were valid except that the documentation was not properly completed. Performance personnel involved were counseled about improper use of procedures. The valve stroke timing test procedures will be changed by Performance personnel to allow for use in Mode 3, Hot Standby, and this should prevent recurrence of this problem.

A review of McGuire Licensee Event Reports (LER) did not reveal any Reactor Trips, Near Miss Reactor Trips, or Engineered Safety Features actuations within the past three years that were attributed to a Personnel Error because the action taken was accidental. Therefore, this event is not considered to be recurring.

This event is not reportable to the Nuclear Plant Reliability Data System (NPRDS).

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CORRECTIVE ACTIONS:

Immediate: Operations personnel implemented the Reactor Trip recovery procedure.

Subsequent: 1) This event was reviewed with PMI personnel involved, and the need was stressed to be extremely careful when working around sensitive plant equipment.

2) Instrumentation and Electrical personnel repaired the broken wire at valve 2CFSVO320.

3) Mechanical Maintenance personnel changed procedure MP/O/A/7650/77, On-line Leak Repair Initial Injection, to include a prerequisite that any special tools or rigging required for the job be used in accordance with standard maintenance practices.

4) An INFORM bulletin has been sent to all McGuire Station Nuclear Production and Construction and Maintenance Department-North personnel detailing the events of the Reactor Trip, stressing the need to be careful

around sensitive plant equipment.

Planned: 1) An Employee Training Qualification System memorandum will be required reading for all McGuire Mechanical Maintenance personnel. This memorandum will detail the events of the Reactor

Trip and stress the need to be careful around sensitive plant equipment.

2) Performance personnel will review and change as necessary all valve stroke timing procedures to allow for more flexible use by eliminating the need for temporary procedure changes to perform valve stroke timing in Mode 3.

SAFETY ANALYSIS:

The Reactor Trip was initiated manually by Operations personnel, and the Turbine Generator Trip was automatic as a result of the Reactor Trip. This Reactor Trip is bound by the "Loss of Normal Feedwater Flow" event of the McGuire Final Safety Analysis Report (FSAR), Chapter 15, Section 15.2.7. The event described in the FSAR is more limiting because it assumes a complete loss of main feedwater. The Auxiliary Feedwater system is assumed to provide decay heat removal capability following an automatic Reactor Trip from Low Low

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Steam Generator water level. The manual Reactor Trip on July 31, 1988 was initiated before the Reactor Protection System would have performed an automatic Reactor Trip. The Main Feedwater system was available after the Reactor Trip and Steam Generator water level did not go as low as predicted in the FSAR. Therefore, the transient was less severe than that analyzed in the FSAR. The Auxiliary Feedwater system started automatically as designed and provided necessary additional feedwater flow to all four Steam Generators to assist in returning Steam Generator water level to normal.

All primary and secondary system parameters necessary to ensure a safe shutdown were at or approaching no-load conditions 30 minutes after the trip. The Steam Generator Power Operated Relief valves EIIS:RV! and Safety Relief valves EIIS:RV! did not open and were not challenged. The Reactor Coolant system Power Operated Relief valves and Safety Relief valves did not open and were not challenged. This Reactor Trip presented no hazard to the integrity of the Reactor Coolant system or Main Steam system EIIS:SB!.

There were no personnel injuries, radiation overexposures, or releases of radioactive material as a result of this event.

This event is considered to be of no significance with respect to the health and safety of the public.

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DUKE POWER

August 30, 1988

U.S. Nuclear Regulatory Commission
Document Control Desk
Washington, D.C. 20555

Subject: McGuire Nuclear Station, Unit 2
Docket No. 50-370
Licensee Event Report 370/88-08

Gentlemen:

Pursuant to 10CFR 50.73 Sections (a)(1) and (d), Licensee Event Report 370/88-08 concerning manual reactor trip initiated when a main feedwater valve failed closed. This report is being submitted in accordance with 10CFR 50.73(a) (2) (iv). This event is considered to be of no significance with respect to the health and safety of the public.

Very truly yours,

Hal B. Tucker

SEL/321/mmf

Attachment

xc: Dr. J. Nelson Grace American Nuclear Insurers
Regional Administrator, Region II c/o Dottie Sherman, ANI Library
U.S.Nuclear Regulatory Commission The Exchange, Suite 245
101 Marietta St.,NW, Suite 2900 270 Farmington Avenue
Atlanta, GA 30323 Farmington, CT 06032

INPO Records Center Mr. Darl Hood
Suite 1500 U.S. Nuclear Regulatory Commission
1100 Circle 75 Parkway Office of Nuclear Reactor Regulation
Atlanta, GA 30339 Washington, D.C. 20555

M&M Nuclear Consultants Mr. W.T. Orders
1221 Avenue of the Americas NRC Resident Inspector

New York, NY
0020 McGuire Nuclear Station

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August 30, 1988
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bxc: P.M. Abraham
B.W. Bline
C.M. Bodsford
D.R. Bradshaw
R.M. Dulin
H.E. Edwards
R.C. Futrell
R.M. Glover (CNS)
C.W. Graves
G.W. Hallman
C.L. Harlin (ONS)
A.D. Harrington (PSD)
A.R. Hollins
M.D. McIntosh
J.J. Maher
B.L. Peele
R.P. Ruth (MNS)
R.O. Sharpe (MNS)
A.R. Sipe (MNS)
J.E. Thomas
V.B. Turner
R.L. Weber
QA Tech. Services Manager (EC 12/58)
QA Tech. Services NRC Coordinator (EC 12/55)
S.S. Kilborn (W)
N.A. Rutherford
R.L. Gill
S.A. Gewehr
P.B. Nardoci
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ACCESSION #: 8809260247
